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THE MARCH OF MEDICINE[1]

By RAY LYMAN WILBUR, M.D.
PRESIDENT OF STANFORD UNIVERSITY

WHAT is it that happens that brings about the development of hospitals, and eventually medical schools, in most of our larger communities? Communities have personality, ambitions and vision. How interesting it would be if we could have been in Geneva in 1834 when the parent institution of the College of Medicine of Syracuse University was established; or could have attended the meetings that led up to its transfer to Syracuse under its present title in 1872. Something stirs in our communities that leads to the birth of institutions where medical students can be trained. The idea generates among the forward-looking physicians and spreads to others. As we look over the United States we find that this form of community expression has been a very significant factor in medical education. In the days when a group of physicians could get together and organize a medical school that could be supported by the student fees too many such institutions appeared; but even now, with all the expense—and it is very considerable—of developing a medical teaching center, we find that most of the larger centers of population in the United States give strong financial support to training institutions for doctors of medicine. Communities, like persons, want to see the tangible results of their efforts. They show themselves at their very best in the public or government buildings which they erect and support—whether these are churches, schools, hospitals, medical schools, court houses—or even jails.

Medicine moves forward so rapidly that its day-to-day activities are necessarily educational. It is in no way *finished.* It is imperative that the young doctor and the nurse be brought into the immediate care of the sick. In no other way can medicine keep up with

[1] Address at the dedication of the Syracuse University College of Medicine building, November 22, 1937.

the constant flow of new information and the resultant new responsibilities of the profession. The patient-teacher relationship has been found to be essential. If medicine is to move forward, there must ever be new inquiring minds asking questions. In no other way can the steady stream of new medical knowledge, often muddy at first, be gradually cleared by further experience and experiment. Just as soon as one medical problem is solved, a new series is opened up by that solution. Each day in the hospital, or in the office, has its particular needs; and yet the experience of each day must be analyzed and understood in order to solve the difficulties of future days. A constant freshening of the stream of knowledge is imperative, and a constant recruiting of new men and women into the service of the sick.

Institutions are necessary; and these institutions must be developing and advancing with the changes in medicine. In the period when the prospective doctor was an apprentice, his education depended not only upon the doctor to whom he was apprenticed but upon the amount of laboratory, library or other equipment that physician had available and upon the experiences of a single practice. This was necessarily a simple and a very limited relationship. Dr. John Morgan, of Philadelphia, in the period of the Revolutionary War conceived the idea of the development in America of a school, instead of apprenticeships, as a basis of medical training. This made it possible to gather together libraries, dissecting rooms, museums and other facilities at one point and to help them to grow. In this way a great deal of time could be saved and breadth given to medical training. Advances were few for some decades, but in the last thirty years the growth has been startling and of high quality. In the complications that have come into the medical world with increased knowledge, even a general hospital with its variety of sick and its many departments has not been adequate for the training of the physician. We have had to make the hospital a medical center through the addition of the nurses training school, the physical therapy department, social service, laboratories and out-patient clinics—as well as adding special hospitals, particularly those in psychiatry and communicable diseases. We are here to-day to celebrate the adequate housing of such a center.

The greatest asset any city can have is security in the health of its citizens. A pure water supply, wholesome food, protection from malaria, typhoid fever, smallpox, scarlet fever and tuberculosis—indeed the control of as many factors as possible that are detrimental to health—are all essential in laying the basis for a sound community life. The security of health is really more important than the school; for there is no particular advantage in giving expensive educational training to children who are going to be allowed to die of typhoid fever, malaria or tuberculosis before they can become assets to the community.

For many years in our medical schools it was thought that the student could be trained in medicine largely through the lecture system. When the laboratory became an essential part of every medical school and hospital the most striking change in medical education took place. The laboratory took more student hours than the lectures. After some years of use of the laboratory there came a greater appreciation of the need of immediate contact between the patient and the medical student. This gave vitality to the medical course and was mutually profitable. The medical student gained in knowledge, and the patient gained in better and more intensive care. The best policeman for good medical service is a wide-awake medical student in the wards of a hospital. We still use the lecture system for parts of medical training; but there is such constant change with new research that lectures must be kept up to date to be satisfactory. Some years ago I suggested to the members of a faculty that if they had their lecture notes complete and just right to their own satisfaction the thing to do was to tear them up and start all over again. All the lecturer can do in the medical course is to provide summaries of known information and stimulate the interest of the student in going further. I know of no more pathetic thing to see in a medical school than students devotedly taking down the lectures of their professors with the idea that they will parrot back the results and will have acquired a medical education. In essence, medical education is purely personal. It requires the most rigid training of the body and the mind of an active, healthy, alert individual who can turn his full mental powers into a clear focus on the obscure complaints and ailments of a suffering human being. This can be learned only by *doing*—not by being told. "Doing" gets one down to fundamentals and away from theories. I like to tell the story that came out of this part of your state to us in Washington in the war days. During a period of active discussion of a pressing problem, with wide differences of opinion, a man rose and said, "Up in the part of New York State where I come from we have a theory that 'the man who sleeps on the floor can't roll out of bed.' Why not adopt that theory and get down to fundamentals on this question?"

There has been a great deal of discussion about the length of time consumed in the medical course, about the number of subjects required, the complexity of the medical curriculum, and so on. Within the limitations of human growth during the period of late adolescence and early maturity we can afford to take a considerable period of the time of a prospective doc-

tor. It is perfectly clear that the sounder the preparation the better the doctor. Up to a certain point we can learn much more and much faster in the medical school and hospital under guidance than we can learn outside of it. There is, though, the inevitable time when the medical student must start off on his own course, his own career and his own responsibility. His sensitiveness to new knowledge is markedly increased at that time. There is a limit to the amount of information that we can pack into the student or the amount of training which he can be given in an educational institution; but in the field of medicine we must go as far as we legitimately can. It is much better to learn under the guidance of an expert in a way that protects the patient than it is to learn through the tragedies that may follow learning to practice without sufficient preliminary training.

There has been a marked improvement in the quality of the medical students of America. This has not come about by chance. There has been the most careful selection of these students by most institutions and a very careful weeding out of incompetents. Fortunately each year there appear at the doors of our medical colleges sufficient numbers of well-prepared young men and women to enter the field of medicine. There is no reason why we should take into our medical courses students who have the attitude common in college which we call "getting by." Nobody wants a "get by" doctor. There is no reason for training this type of student in the medical school, with the very high cost of medical training to the student and to the public. Particularly is this not justified since there is the possibility of securing sufficient medical men for the needs of the nation without training those who fail to see the importance of giving their very best if they are to take on the responsibility of the care of the sick and of the injured. With improved public health and better facilities of all sorts, one doctor can do more in twenty-four hours than was ever possible before, and do it better. In medical education we need a blend of the highest form of scientific training, laboratory experience and clinical experience. Every medical faculty needs men upon it who represent the art as well as the science of medicine. While for a time the laboratory was given over-emphasis, we have learned to build our institutions so that there is greater opportunity for clinical experience. What the profession and its members have gained over the years in insight into disease and into the reactions of the human being, is often more valuable than anything that can be gotten out of a test-tube or seen under a microscope. This is particularly true as we become more effective in preventive measures and push out of the ordinary medical picture diseases that have ruled the earth for countless generations.

Medical education now requires the background of an extensive medical center where not only do we have doctors, nurses and laboratory technicians but also public health officials, social workers and others. It is just as important in these days for the young doctor to understand his patient's personal life, home responsibilities and community relationships as it is to be able to tell just what organisms are living in his lungs or invading his liver. In medical education we can no longer view disease an an entity. We must always take the patient as the unit and understand the relationship of pathological processes to his body, particularly to his nervous system, and his own reactions and relationships to the life around him. For centuries the doctor treated diseases. He still does so when these have specific causes that can be removed, or where there are conditions, such as in diabetes, where certain specific forms of treatment are possible. Dr. Osler once said that he could teach medicine on typhoid fever patients alone, and do it successfully. That now many of our best medical schools and hospitals have no such patients indicates the striking changes which have taken place in the incidence of certain diseases. The day-to-day work of the hospital has undergone as significant changes. The amount of practice in the home has been strikingly reduced. Health has become significant and well enough understood so that we are discussing in medical circles the question of understanding normality as well as we do abnormality. In fact, the doctor has now become more of a guide from babyhood to maturity than some one called in to help out in emergencies or to prevent tragedy.

Most people have but little idea of how to care for their bodies, or use their brains or be well enough to be happy. Millions of them keep themselves under the partial influence of caffeine, alcohol, nicotine, aspirin and other drugs a good deal of the time. From childhood they never play fair with the finest machine on earth. The doctors themselves are not always good examples, and many of them care for their automobiles better than they do for themselves. The doctor who guides normal people to continued good health will have to look at his patient from the standpoint of sound hygiene, rather than as the receptacle of a disease that needs to be driven out. The doctor of the future can not play his part unless he understands all phases of the life of the human being. He must have similar understanding of the problems of human beings in groups or in the mass. The doctor who has not studied psychology and who can not acquire a knowledge of it, if he is to be successful will have to confine himself to work in the laboratory or be a pure technician. The understanding of personality is as vital as the knowledge of the various systems of the human body and of the ailments to which they are

subject. Science has been back of the march of medicine, and science has also made a complete transformation in the environment in which our people live. Science has not only changed the speed with which we go from place to place, and the way in which we light our homes; but it has compelled a reorientation of our hereditary thought processes in connection with religion and human conduct. Astronomy and geology have changed the mental attitudes of millions. Individually and in the mass we lack anchorage. This has given us a sense of insecurity, increased our difficulties in the domain of the mind and helped to fill our psychiatric institutions. In some ways many of the people of practically all the nations of the earth seem to be a little crazy at the present time. There could well be developed a better hygiene for world international relations. At any rate there is a good place for sound medicine and the stable sane doctor to guide not only the individual in the care of his body and his protection from disease, and the community in its various quarantine and other public health measures, but to assist in the broad understanding of human relations.

The medical school, too, now faces the problem of how it should handle the question of what is called "social medicine." The development of the social service, the increasing costs of hospitals, the changes from rural life to city life and a thousand other forces have impinged upon the whole easy, rather shabby organization of medicine with its illy defined relationships of the financial responsibility of doctor and nurse to the patient and to various governmental units. Since it is inevitable that there will be many social and economic changes in the future, the medical school must give the young physician the opportunity of knowing just what the forces are that lead to change. Unless he is trained to accept leadership in the field of the relationship of medicine to our economic life, he will be compelled by inevitable developments to take a secondary position—when he *should* lead, and where his help is vital if an adequate solution is to be discovered.

The medical schools of the country have for the most part been brought under the wings of the university by the simple and necessary process of evolution. The preliminary requirements for the study of medicine have naturally fallen to the universities. The laboratory led to the capture of the medical school by the universities. The broader training now required for the modern physician means that at least some of those who are going into medicine must not only understand biology but also anthropology and eugenics. Likewise they must have knowledge of sociology, including a broad consideration of man's environment. Modern physiology has developed relationships to chemistry and physics that require years of training if we are adequately to understand such questions as diet and nutrition and to treat many diseases. Almost any solid work is good preparation for medicine, since mental training is more important than the details of any subject learned. A usable mind that is disciplined can do the work; but it must be adjustable and have a good "universal joint" to meet the wide responsibilities entailed in the care of the sick.

It has been a difficult task to select some of the scientific and social subjects that are the core of the work which we call the medical curriculum. Even when this curriculum is once selected it can not be allowed to become static. Each year modifications must be met. The medical curriculum must not only be kept alive, but it must be modified with the same rapidity with which medicine grows.

There is no ease in the march of medicine. Thousands of ardent workers are pushing out into new fields; lives are to be saved, pain relieved. To keep the doctor up to date and bring the medical student abreast by the selected information he needs is both the function and the duty of such organizations as this. It is a delight to take part in seeing the city of Syracuse and this part of the state give support to such a medical center as we now have as a national possession in the College of Medicine of the University of Syracuse.

THE FRUITION OF THE CLINICIAN[1]

By Dr. HENRY A. CHRISTIAN
HARVARD MEDICAL SCHOOL

To you, Chancellor Graham; to you, Dean Weiskotten; to you, members of the Faculty of Medicine of Syracuse University; to you, students and graduates of this School of Medicine and to you, friends of Syracuse University and its School of Medicine here assembled, I give greetings for and from the medical profession.

This splendid building to house your medical school, that to-day you dedicate, is one of a group which in the years to come will provide the soil whence will grow in varying perfection plants that will bear fruit of different sorts and of different qualities. The better

[1] Address at the dedication of the Syracuse University College of Medicine building, November 22, 1937.

this foundation soil, the better will be the product. The spirit of those who here in this building will tend the beginnings of these plants more than anything else will determine the quality of the final fruit; these buildings will fail of their purpose unless into them are gathered men who from the beginning can inculcate into the students, who gather here, the will to reach the highest possible level of attainment in whatever branch of medicine they may select for their life work.

I would say to you, who have the selection, see to it that only men of the highest quality are chosen to fill your posts; select young men of great potential force, character and ability and see to it that nothing hinders their continued progressive development; by and large the young man of fine possibilities will accomplish far more in nurturing the proper spirit among your students than will the older man of proved merit but waning enthusiasm; provide a way for the early translation of your professors into other paths of usefulness that they may not block the rapid advancement of your young men.

From the soil here provided will grow a variety of plants and you of the school will watch with eager solicitude their fruition. To-day I will consider in the remaining time allotted to me the growth, development and final fruition of one of these, the clinician; I will address myself chiefly to the young generations, medical students, hospital internes and beginning practitioners of medicine.

You, young men, stand now at the entrance way to a pleasant path, which you will follow in its winding course throughout your professional life, a path leading toward the goal of attainment, which is the aim of almost all of you, your fruition into a finished clinician, the highest attainment of a medical career. The path is a long one, over which you can not race. As it meanders along, the turnings of your path may be abrupt; what is just around the corner always is uncertain; haste will close vistas that open before you now on this side, now on that, vistas which bring enlightenment to the clinician. Year by year you will follow such a path until a day will come, some fifteen or twenty years hence, when suddenly from some elevated point you catch a glimpse of broad expanses of hill and dale and plain with snow-capped peaks in the distance; until this panoramic view comes before your eye, you have not developed into a real clinician.

The studies which now you pursue in the medical school lay a broad foundation on which in later years you can build. Your curriculum has been wisely selected by men, who themselves have trod the path and so know what sort of a foundation you will need as a basis for a development into those qualities of mind and soul that make the clinician. However, remember that, with all diligence in learning, within the medical school course you can but plant the roots. When you complete this course and are pronounced graduates in medicine, you are very far from being clinicians, perhaps actually not very much nearer that goal than when you graduated from college, though far better fitted now to take the necessary next step.

The important next step is securing an interneship in a well-equipped hospital possessed of a staff of able clinicians who spend much time within the hospital in the study of patients. What information should you seek in determining the hospital for your interneship? I would suggest the following: (1) The ratio of patients to house officers; this should be small, for too many patients make impossible that careful study of each patient that is essential to the best development of the interne; each patient carelessly studied adds a deteriorating influence on the interne; hospitals commonly have too many patients in proportion to the number of house officers; I know of no hospital in which there are too few. (2) The ratio of autopsies to deaths; the most desirable hospital for interneships is one in which the autopsies are 50 per cent. or more of the deaths; a percentage of 25 per cent. may be regarded as the minimal requirement to constitute a hospital as being desirable for an interneship; without an autopsy soon the physician may acquire a false certainty of his diagnostic ability that will be fatal to progress. (3) A senior visiting staff that daily spends considerable time in the wards examining patients and dictating notes of their findings with comments on the probable diagnosis; remember that for surgeons, time spent in the operating room is not a satisfactory substitute for time spent in the examination of new patients; the visiting physician or surgeon too busy to spend time in the wards is a liability to the hospital. (4) The positions held by previous internes of the hospital; the attainments of past internes is a safe measure of the quality of the training offered by the hospital; curiously, few hospitals in any way make this knowledge available to prospective internes. (5) A hospital that has a super-interne staff of assistant residents and residents. (6) Absence of salary; do not select a hospital that offers you a salary; a salaried interneship rarely is one to seek; salaries for internes usually indicate a lack of educational opportunities in the hospital; salaries mean that the hospital knows it has not enough to offer to attract internes, and the salary is a sort of hush money to conceal this fact. (7) A long rotating service or a shorter, straight service in medicine or surgery; never a service in a specialty except after completion of a general service.

After completion of an interneship, further residence in a hospital in some capacity should be sought. If one expects to qualify before one of these newer boards of certification this becomes a necessity. A

minimum of two years of this type of super-interne service should be taken. Perhaps one of the greatest influences in sound post-graduate education in clinical medicine and surgery at present lies in what is represented by the positions of assistant resident and resident in our hospitals. Men holding these posts teach much of great value to the internes, while they themselves are learning much of the greatest importance in their subsequent development.

At some time in his training the prospective clinician should spend one or two years in one of the laboratories of the medical sciences. A position combining opportunity for teaching students with investigation is very ideal. Just which of the medical sciences is followed is relatively unimportant, though personally I believe pathology offers the best preparation for the future clinician.

It may not be possible for every student to have as much training as I have outlined. He should have as much as possible, planned in general along the lines indicated. With this completed, then the prospective clinician has been thoroughly grounded in the fundamental knowledge that he will need. From now on, all will depend on his own effort. How the man daily carries on the clinical work that comes to him determines what sort of a clinician eventually will he become. It is very important that he should record ample histories and full notes on the physical examination of his patients. To depend on memory is notoriously untrustworthy. Many a tragedy of bad treatment has resulted from a failure to make notes. With such a foundation, as I have suggested, each patient whether in hospital or home, can be studied just as thoroughly as is possible to any one.

So far I have said nothing about reading. To-day often the complaint is made that so much is published that one can not keep up with it. This is but the excuse of the lazy. It is surprising how little daily reading is needed to keep one well informed in medical literature. Books and journals are necessary to the making of a clinician. Etymologically, clinician appears to mean he who sits by a bed, but the meaning of clinician, as we understand it to-day, has greatly broadened from that early meaning. Assuredly he, who merely sits, will never become a real clinician, and yet hours by the bedside of patients is a necessary part of the training of the clinician but not hours of merely passive sitting. Observation by the bedside reveals more and more in proportion to the observer's knowledge of the observations of other clinicians as recorded in books and journals. The developing clinician needs to record carefully, accurately, in great detail what he observes and then to check his observations with those recorded in medical literature. A good way to do is to observe your patient, then read all you can find about the things you have observed and finally reobserve your patient in light of what you have read.

Clinical work, though it entails years of training before one becomes an accomplished clinician, is never a dull existence. There is ever in medical work that uncertainty of what is just around the corner that makes of exploration and investigation a great appeal to men. Each new patient is like the uncharted sea or the unmapped land; in advance it is not known what is to be revealed. The new patient may present phenomena never before witnessed by you, perhaps never before described by any medical man in all time. New diseases still are being discovered, new methods of treating them are being developed, but the new is not appreciation by the physician of small experience, not cognizant of what already has been written in medical literature. The more one knows, the more one sees that is new; the greater the experience and the learning of the clinician, the greater his pleasure in his work.

Just how long it takes to make a clinician obviously varies with the industry and ability of the individual. However, fifteen to twenty years after graduation seems to me a reasonable period of time to set as the minimum for development into a clinician. My experience has been that there is at about that time a rather abrupt change in your medical mental attitude, marking the time when one first realizes that he has acquired certain powers that go to make up a developed clinician. Quite suddenly a certain vision is acquired that enables you to see in patients relations of things that hitherto have been missed. Prior to this time this power has been lacking. Not until it is acquired can you be considered a developed clinician.

Fifteen or more years seem to you now a very long period of time, but little do you realize how rapidly these years will speed by. Your pathway to the ultimate goal of your medical development is a pleasing one. Many pleasures await you as you tread this path. There is the consciousness of a developing knowledge of medicine. There are happy associations with colleagues and patients. There is the satisfaction of a task being well done. There is the reward of an earned income more than sufficient to meet your actual needs in life. Your influence on patients and associates can be of great usefulness. There is the pleasure of doing your part in the community life that surrounds you. As you go along, you can by your work contribute to the store of medical literature observations that will be helpful to other physicians and surgeons. Finally, when you have attained your goal of becoming a clinician, all these rewards of your work will continue with an ever-growing increment, and there will be added the very great satisfaction of being

able wisely to guide younger men along their path of development. As the years go on, diligence in following the path you have chosen increasingly will have its reward in bringing you closer and closer to the goal of your endeavor, fruition into a perfected clinician.

Do not gather from what I have said that medicine and its practice is all a matter of mind. Much, too, of its success lies in its soul. The medical man should be an exemplar in his community of the worthy life. His dealings all must be upright and honest. He must be fearless to espouse the right; his habits free from criticism. He will need the support of a true religion. A simple faith in God and his ways should emanate from all true physicians. If he believes not, this will not be possible. The believing physician often can bring into perfection a cure not otherwise attainable. There is no place in the profession of medicine for the agnostic, the atheist. Man needs a religion and particularly when he is sick. Religion is not a matter of form but of simple faith. With it physician and patient meet the trials of life and ill health with chin up and a winning smile. I would say to all of you and especially to you, young men, have a religion of faith and belief; it will help you over many a hard place.

As one who for nearly forty years has been following this path toward fruition into a finished clinician, I welcome you to the joys of its meanderings. To me the journey has been a very happy one. I have never held in high regard the medical man who constantly tells of how hard he works rather than speaking of the joy he gets from his work. I have enjoyed a simple faith in God. I look back in memory on many pleasing vistas, on meetings with delightful companions, on friendly helpful guidance and inspiration from men of great attainment in our profession who were treading the same path in advance of me and on the opportunity of giving a helping hand to a splendid group of younger men, to whom it has been my good fortune as their chief to be a guide as they in their turn have entered on the beginnings of this clinical path. For me there are not many more turnings in the path to take. At the end of next academic year my active steps along the path will end, and I will retire from active medical work to watch the way of those coming after me, joyous that I have had the pleasures of pursuing the path that leads to fruition into a clinician. Many of you, doubtless, will get farther along the way, but none, I am sure, will find more happiness in it than have I. I can do no more than wish that each of you will have such happiness in treading the pathway as has been my lot, blessed with guidance from notable teachers, in contact with delightful colleagues and looking back on a succession of eager, capable pupils in the pursuit of their goal of a clinical fruition. I say unto you: the life of the clinician verily is a happy one.

OBITUARY

GEORGE ELLERY HALE

GEORGE ELLERY HALE died at Pasadena at 1:30 o'clock on the afternoon of Monday, February 21, as the final result of a nervous collapse which had completely incapacitated him since the summer of 1936. In the words of Harlow Shapley, "All astronomers of the world join in mourning the passing of the greatest builder of American astronomy." But the mere tribute of astronomers will not fully satisfy those who worked with George Hale in the upbuilding of the National Academy of Sciences, in the establishment of the National Research Council, in the starting of the *Astrophysical Journal,* in the founding of the Yerkes Observatory, in the building of the Mount Wilson Observatory of the Carnegie Institution of Washington, in the development of the California Institute of Technology, in the promotion of the Huntington Library and Art Gallery, in the organization of the Pasadena City Planning Commission, in the creation of the plans for and the construction of the 200-inch telescope which in a few years will be exploring the far reaches of the universe from the top of Palomar Mountain, 93 miles southeast of Mount Wilson.

The mere enumeration of these projects illustrates the ceaseless activity, the extraordinary versatility, the prodigious energy of the man. He suffered no end of mental torture because of his endowment of an exceedingly active and inquiring mind and a relatively frail body. A born leader, a consummate promoter, a conscientious, painstaking and devoted scientist, he worshipped first and foremost, from early youth up to the very end, the goddess of scientific research, but he added to that love and devotion a very keen sense of his public responsibility. He was conscious of his own powers as a promoter and organizer of research, and he deliberately kept at it, although he knew full well that his body would probably break down under the strain, as it actually did. But he never let his promoting activities divert him from his individual research enterprises. The discovery of magnetic fields in sun-spots and of the general magnetic field of the sun are his most well-known personal contributions, and the way he worked during the last five years of his life to verify this last effect, which is so small as to be almost outside the limits of measurement, was a marvel to all his friends. That the very recent plate measurements by a new technique check so well the earlier work which gave rise to the announcement of the exist-

ence of the sun's general magnetic field was a very great satisfaction to him.

In the passing of George Ellery Hale America loses not only "the greatest builder of American astronomy" but a great aristocrat in the best sense of that word—a lovable, charming personality, generous to a fault, artistic, conservative, with a keen sense of devotion to public service—a great American citizen.

ROBERT A. MILLIKAN

RECENT DEATHS AND MEMORIALS

DR. FRANK LAMSON-SCRIBNER, until his retirement in 1922 agrostologist and special agent of the U. S. Department of Agriculture, died on February 22 in his eighty-sixth year.

DR. RALEIGH RUSSELL HUGGINS, since 1919 dean of the Medical School of the University of Pittsburgh, died on February 20 at the age of sixty-eight years.

DR. LILIAN WELSH, professor emeritus of physiology and hygiene at Goucher College, Baltimore, died on February 23. She was seventy-nine years old.

THE death is announced at the age of eighty years of Sir Algernon Thomas, emeritus professor of biology and geology at Auckland University College.

THE death at the age of seventy-eight years is reported of Professor Emeritus Paul Ernst, until his retirement in 1928 ordinarius in pathologic anatomy and director of the Institute of Pathology at Heidelberg.

THE sudden death at the age of twenty-seven years is announced of Fritz Kalckar, collaborator of the Institute of Theoretical Physics at the University of Copenhagen, of which Professor Niels Bohr is director.

AN oil portrait of the late Dr. J. A. Udden was unveiled on February 14 at Augustana College (Rock Island, Illinois), where from 1888 to 1911 Dr. Udden served as professor of biology and geology. The portrait, painted by the late Herbert A. Collins, of Berkeley, California, was presented by the Udden Geology Club, student organization of the college. It was unveiled by Miss Jane Udden, granddaughter of the geologist, now a freshman at the college. Professor Anton Carlson, of the University of Chicago, who began his scientific career as a student under Dr. Udden, gave the address, paying tribute to him for the example he set his students by pursuing research under difficult conditions.

SCIENTIFIC EVENTS

THE COST OF HEALTH SERVICES IN GREAT BRITAIN

THE cost of public social services, the subject of a Command Paper recently printed, is summarized in *The British Medical Journal*. The figures relate to 1935 or the latest available year. The cost of national health insurance for Great Britain was £38,344,000, an increase of some £8,500,000 on the figure for 1920. The total number of insured persons directly benefiting was 19,170,000. The expenditure under the Public Health Acts so far as it related to hospitals and the treatment of disease was £14,629,000, a ninefold increase on the figure for 1900, and nearly a sevenfold increase on that for 1910. The number of persons benefiting can not be stated. Hospitals for infectious diseases, for example, are available in case of need to every member of the community.

Again, in maternity and child welfare work, the cost of which was £3,590,000, no precise figures of availability can be given. The returns from local authorities indicate that a total of 581,443 infants and 184,298 expectant mothers were visited during the year, but similar figures of a number of children between the ages of 1 and 6 who were visited by the health visitor are not recorded, and, in addition, an unstated number of children benefited by attendance at centers, day nurseries and hospitals, or by the provision of milk or other food, and an unstated number of mothers by midwifery attendances, food and hospital treatment.

Under the Lunacy and Mental Treatment Acts £2,962,000 was spent in England and Wales, and under the Mental Deficiency Acts £2,755,000. In the figures for Scotland the expenditure under these two acts is taken together and comes to £1,282,000—a lower figure, by the way, than for 1930 or 1920, the years with which it is compared. In England and Wales the combined expenditure on mental disorder and mental deficiency is £1,300,000 more than in 1930, and £2,600,000 more than in 1920. The number of persons of unsound mind in England and Wales accommodated at the expense of the mental hospitals authorities, including the Poor Law authorities, during the year under review was 126,318, but the actual number of mental defectives dealt with under the acts can not be given; upwards of 36,000 were being maintained in institutions or under guardianship, and a much larger number had been "ascertained" or were under supervision. In Scotland the combined figure for sufferers from mental disorder and for mental defectives was 21,152.

THE FRANCIS AMORY SEPTENNIAL PRIZE OF THE AMERICAN ACADEMY OF ARTS AND SCIENCES

IN compliance with the requirements of a gift under the will of the late Francis Amory, of Beverly, Mass., the American Academy of Arts and Sciences announces the offer of a septennial prize for outstanding work with reference to the alleviation or cure of diseases affecting the human genital organs, to be known as the Francis Amory Septennial Prize. The gift provides a fund, the income of which may be awarded for conspicuously meritorious contributions to the field of knowledge "during the said septennial period next preceding any award thereof, through experiment, study or otherwise . . . in the diseases of the human sexual generative organs in general." The prize may be awarded to any individual or individuals for work of "extraordinary or exceptional merit" in this field.

In case there is work of a quality to warrant it, the first award will be made in 1940. The total amount of the award will exceed ten thousand dollars, and may be given in one or more awards. It rests solely within the discretion of the academy whether an award shall be made at the end of any given seven-year period, and also whether on any occasion the prize shall be awarded to more than a single individual.

While there will be no formal nominations, and no formal essays or treatises will be required, the committee invites suggestions, which should be made to the Amory Fund Committee, care of the American Academy of Arts and Sciences, 28 Newbury Street, Boston, Massachusetts, U. S. A.

BROADCASTING BY SCIENCE SERVICE

SCIENCE SERVICE is broadcasting regularly on a definite schedule, presenting a 15-minute program each Thursday afternoon from 4:00 to 4:15. The program is carried by the Columbia Broadcasting System sustaining network.

The plan of the programs is to present each week a well-known speaker, who is interviewed on the air by Watson Davis, director of Science Service. The programs deal with new and interesting developments in science, and the interview is made as simple and clear as possible, since many school children are among the listeners. A copy of the program is offered to any one requesting it by mail; and the requests range from several hundred to over a thousand each week.

Science Service regards radio as an important medium for interesting the public in the aims and achievements of scientific research. It began its broadcasting activities in 1924 and has been continuously on the air ever since.

Shortly after WCAP, operated by the Chesapeake and Potomac Telephone Company, opened its studio in 1924, officials of the station approached the National Research Council with a request for scientific talks at weekly intervals. The Research Council asked Science Service to cooperate, and a committee was appointed to take charge. The first programs were talks by Washington scientific men. In 1926, the station was sold to the RCA, and the science talks continued for a time over station WRC and about 20 other leading stations. Between 1926 and 1930, guest speakers were presented more or less irregularly.

Meanwhile, however, in 1926, Science Service began a Science News of the Week program, prepared as a mimeographed talk for use by local announcers. This program, available to individual stations, has been widely used ever since that year, particularly by educational stations.

In 1930, Science Service began its regular weekly presentation by well-known scientific men over the nationwide network of the Columbia Broadcasting System. These programs were in the form of talks until December, 1935, when the interview type of program was introduced, under the radio editorship of Miss Emily C. Davis, of the staff of Science Service. Science Service does not act as sponsor for any single broadcast or series of broadcasts. Its radio activities are entirely scientific and educational.

THE CHEMISTS' ADVISORY COUNCIL

DR. WALTER S. LANDIS, vice-president of the American Cyanamid Company, with which he has been associated since 1912, has been elected president of the Chemists' Advisory Council, Inc., and Dr. William T. Read, dean of the department of chemistry at Rutgers University, has been elected vice-president. M. R. Bhagwat, who has been secretary of the Chemists' Unemployment Committee, is secretary, and Robert T. Baldwin, secretary of the Chemists' Club of New York and treasurer of the American Chemical Society, is treasurer. The council is the outgrowth of the Chemists' Unemployment Committee, formed six years ago to alleviate distress among unemployed chemists and chemical engineers. It will function nationally as a permanent agency to promote the general welfare of these groups. Headquarters have been established at 300 Madison Avenue, New York City. The council will take over the work of the Chemists' Unemployment Committee, of which Frank G. Breyer, of Singmaster and Breyer, consulting chemists and chemical engineers, is executive chairman. Chronic difficulties in the chemical profession will be studied, and an attempt will be made to suggest methods of reducing the number unemployed in the industry. The council will also serve as a fact-finding committee and central registration office for chemists and chemical engineers.

The relationship of the chemical profession to the chemical industry will be a principal field of effort.

There will be maintained a bureau of personal advice to guide recent graduates, unemployed chemists, unsuitably employed chemists and marginally employed chemists. It will sponsor a placement bureau making available a working register of all chemists and chemical engineers. The entire organization will be conducted by chemists and chemical engineers for chemists and chemical engineers. The council has been chartered as a membership corporation under the laws of the State of New York. The incorporators, who are also members of the board of directors, are: Professor Marston T. Bogert, of Columbia University, past president of the American Chemical Society; William W. Buffum, general manager of the Chemical Foundation; George C. Lewis, of the Columbia Alkali Company and the L. Martin Company; Maximilian Toch, president of Toch Brothers, Inc., and of the American Institute of Chemists; Edward R. Weidlein, director of Mellon Institute and past president of the American Chemical Society; Dr. Landis, Mr. Baldwin, Mr. Breyer and Professor Read.

A GRADUATE SCHOOL OF FORESTRY AT DUKE UNIVERSITY

A GRADUATE school of forestry will be opened at Duke University next autumn, after seven years of preparation. Dr. Clarence F. Korstian, who has been director of the Duke Forest since 1930, has been appointed dean of the school. He is president of the Society of American Foresters.

The school will begin with a full-time faculty of seven professionally trained foresters, in addition to two instructors in botany from the regular university faculty and an administrative staff. At the beginning of the second year, as the first-year class advances, the faculty will be enlarged to provide instruction in additional courses. The present members, in addition to Dean Korstian, who is professor of silviculture, are: T. S. Coile, assistant professor of forest soils; Dr. Ellwood S. Harrar, associate professor of wood technology; Dr. Paul J. Kramer, assistant professor of botany; William Maughan, associate professor of forest management; Francis X. Schumacher, professor of forestry; Roy B. Thomson, associate professor of forest economics, and Dr. F. A. Wolf, professor of botany.

The Duke forest of 4,938 acres directly adjoins the university campus, providing the school with a practice, demonstration and experimental forest that is entirely unique in this country in regard to its proximity to the forestry school. Laboratory and greenhouse facilities are provided in the building for biology. In addition an arboretum covering 300 acres is being developed in which fifty-four species of trees have already been planted.

There will be no undergraduate degree offered. The school will accept for entrance men who have received their bachelor's degree from other universities, as well as those completing the pre-forestry course at Duke. The master of forestry degree will be available to such men in one or two years depending upon their previous training. The M.A. and Ph.D. degrees will be given for work in the scientific phases of forestry through the university graduate school. For this work the staff of the School of Forestry will serve as members of the forestry division of the Graduate School.

Summer school courses in forest surveying and forest measurements will be given and, during the two semesters of the regular school session, courses will be conducted in the fields of silviculture, forest management and valuation, forest soils and mensuration, dendrology, wood anatomy, forest economics, utilization, tree physiology, pathology, entomology and game management. During the past seven years the new school has acquired the needed educational facilities for its full operation. It is housed in the new biology building, which contains classrooms, laboratories, offices, a library, three refrigerated rooms, an incineration room, a workshop and eight dark-rooms. It is well provided with equipment necessary for teaching the field and laboratory phases of forestry and allied courses. The forestry section of the library includes important books and periodicals in English, and in French, German and certain other foreign languages. Over 150 periodicals and serials of importance in forestry and related fields are received.

NEW SCIENTIFIC JOURNALS

THE first number of the *Journal of Neurophysiology* has been issued. It is under the management of an editorial board composed of Dr. J. G. Dusser de Barenne and Dr. J. F. Fulton, Sterling professors of physiology at Yale University, and Dr. R. W. Gerard, professor of physiology at the University of Chicago. An advisory board of twenty-five distinguished physiologists from the United States and abroad will collaborate. The primary aim of the journal, which will be issued bi-monthly, is to provide a channel for prompt publication of original work bearing on the functions of the nervous system, peripheral and central. It has been planned to embrace all aspects of the subject amenable to experimental analysis; it will not include morphology for its own sake nor neuropathology, and only those clinical, psychological or zoological contributions will be considered which are primarily experimental in character.

The Journal of Geomorphology, edited by Dr. Douglas Johnson, professor of physiography at Co-

lumbia University, is a publication issued by The Columbia Press. It aims to provide an "open forum for the discussion of all problems concerning the origin and evolution of the earth's surface features." The hope is expressed that the journal "will do much to advance the scientific study of land-forms, that competent criticism and full exchange of views will serve to perfect and codify the knowledge already gained in this field of earth study, and that publication of methods and results of geomorphic researches will aid the investigations of every worker in this growing science, and thus materially enlarge the sum of geomorphic knowledge." The journal will appear four times each year in February, April, October and December.

SCIENTIFIC NOTES AND NEWS

DR. WILLIAM LAWRENCE BRAGG, who recently resigned from the Langworthy professorship of physics at the University of Manchester to become director of the British National Physical Laboratory, has been appointed Cavendish professor of experimental physics and director of the Cavendish Laboratory of the University of Cambridge, to succeed the late Lord Rutherford of Nelson. Professor Bragg, with his father, Sir William Bragg, director of the Royal Institution, received a Nobel prize for work on x-rays and crystal structure.

THE Academic Senate of the University of Edinburgh, on the recommendation of the Faculty of Medicine, has awarded the Cameron Prize for 1938 to Dr. Karl Landsteiner, member of the Rockefeller Institute for Medical Research, New York, in recognition of his researches on iso-haemagglutinins and blood groups and for the influence of his discoveries on the practice of therapeutic blood transfusion.

THE fiftieth anniversary of the association of Dr. Witmer Stone, director emeritus of the museum, with the Academy of Natural Sciences of Philadelphia, of which he is now vice-president, occurred on February 27. For twenty-five years he was the editor of *The Auk* and served as chairman of the committee that compiled the check list of North American birds in 1931 for the American Ornithological Union.

DR. GEORGE HOYT WHIPPLE, dean of the School of Medicine and Dentistry of the University of Rochester, has been awarded the Charles Mickle Fellowship of the University of Toronto for his work on pigment metabolism and regeneration of hemoglobin.

A BRONZE bust of Sir Arthur Keith was presented to him on February 14 by his friends and old students. The presentation was made by Sir Cuthbert Wallace at the conclusion of a lecture on "The Prehistoric People of Mount Carmel," delivered by Dr. Keith at the Royal College of Surgeons. The bust is the work of Miss Kathleen Parbury.

THE Duddell Medal of the Physical Society, London, has been awarded to Dr. H. Geiger, professor of physics at the University of Tübingen.

THE Hanbury Medal for 1937 of the Pharmaceutical Society of Great Britain was presented on February 8 to Dr. A. B. Wasicky, professor of pharmacognosy in the Pharmaceutical Institute of the University of Vienna. The lecture given by Dr. Wasicky on this occasion was entitled "Modern Points of View and Methods in Pharmacognosy."

DR. PEYTON ROUS, of the Rockefeller Institute for Medical Research, New York, has been elected a corresponding member of the Academy of Medicine in Paris, in the Division of the Biological Sciences.

M. FRANÇOIS GRANDJEAN has been elected a member of the Academy of Sciences, Paris, in the section of mineralogy, in the place of the late M. H. Douville.

DR. EMIL ABDERHALDEN, professor of physiology at Halle, has been elected a member of the Radio Biological Society of Italy.

THE following officers were elected on February 11 at the meeting of the Royal Astronomical Society, London: *President,* Dr. H. Spencer Jones, Astronomer Royal; *Vice-presidents,* Professor S. Chapman, Professor H. Dingle, Sir Frank Dyson and Professor F. J. M. Stratton; *Treasurer,* J. H. Reynolds; *Secretaries,* Professor W. M. H. Greaves, Professor H. H. Plaskett; *Foreign Secretary,* Sir Arthur Eddington.

DR. PHILIP B. ARMSTRONG, for twelve years a member of the department of anatomy of Cornell University Medical School, has been appointed professor of anatomy in the College of Medicine, Syracuse University.

THE trustees of Tufts College have established a laboratory for research in sensory psychology and physiology, which will be under the direction of Dr. Leonard Carmichael, who was recently elected president of the college. Bertram Wellman, now research associate in psychology at the University of Rochester, an expert in the application of electrical techniques to psychological and physiological problems, will become assistant director of the laboratory.

PROFESSOR RENÉ LERICHE has been appointed to the

chair of medicine in the Collège de France, as successor of the late Professor Charles Nicolle.

THE title of professor emeritus was conferred by the University of Durham on Professor H. J. Hutchens on the occasion of his retirement from the Heath professorship of comparative pathology.

PROFESSOR ALEXANDER MCKENZIE will retire at the end of the present session from the chair of chemistry at University College, Dundee, after serving for twenty-four years.

NOMINATIONS to the council of the American Association of Museums for the three-year term 1938–41 have been made by the council as follows: Hermon Carey Bumpus, trustee of the Children's Museum, Boston; George H. Edgell, director of the Museum of Fine Arts, Boston; Henry W. Kent, secretary of the Metropolitan Museum of Art, New York; Fiske Kimball, director of the Pennsylvania Museum of Art, Philadelphia; Luke Vincent Lockwood, trustee of the Brooklyn Museum, New York; Frederic B. Pratt, president of Pratt Institute, New York; Alexander G. Ruthven, president of the University of Michigan; Hardinge Scholle, director of the Museum of the City of New York; H. C. Shetrone, director of the Ohio State Museum, Columbus; Clark Wissler, curator of anthropology, American Museum of Natural History, New York.

THE *Journal* of the American Medical Association reports that Dr. Louis I. Dublin, vice-president of the Metropolitan Life Insurance Company, has been elected acting chairman of a group incorporated to establish an American Museum of Health. The park commissioner has set aside space on Ward's Island, New York City, which is now being developed for recreation purposes. It is believed that the buildings of the Manhattan State Hospital, now being vacated, can be used temporarily for the exhibits, for which the health and medical exhibits at the New York World's Fair, 1939, may be used as a nucleus. Other members of the group of incorporators are Drs. George Baehr, representing the New York Academy of Medicine; David J. Kaliski, chairman of the coordinating council of the five county medical societies in New York City, and Dr. John L. Rice, health commissioner, and Homer N. Calver, director of health exhibits at the fair.

THE Committee on Scientific Research of the American Medical Association has made the following grants: Lester R. Dragstedt and G. M. Dack, University of Chicago, relationship of *Bacterium necrophorum* to chronic ulcerative colitis; Charles G. Johnston, Wayne University, Detroit, intestinal obstruction; Solomon Strouse and B. O. Raulston, University of Southern California, sodium-potassium relationship in diabetes; George M. Curtis, Ohio State University, iodine and calcium metabolism in thyroid disease; Catharine Macfarlane, Woman's Medical College of Pennsylvania, value of periodic pelvic examination in detecting cancer of the uterus; Lincoln Opper and Barnett Sure, University of Arkansas, vascular disease in rat avitaminosis; Samuel Soskin, Michael Reese Hospital, Chicago, chemical tests for endocrine dysfunction; Albert P. Krueger, University of California, bacteriophage; Henry Laurens, Tulane University, lowering of arterial pressure by carbon arc radiation; Robert W. Virtue, University of Denver, formation of bile acids; Moore A. Mills and Francis D. Gunn, Northwestern University, experimental pulmonary tuberculosis in dogs; Arthur H. Smith, Wayne University, Detroit, serum proteins in relation to blood volume.

N. K. JOHNSON has been appointed director of the British Meteorological Office, the appointment to take effect on the retirement next September of Sir George Simpson.

LLEWELYN WILLIAMS, curator of economic botany at Field Museum of Natural History, Chicago, has sailed from New York to accept an appointment to engage in special work for the ministry of agriculture of Venezuela. He will go to Caracas, where he will assist Dr. Henry Pittier, the Swiss botanist, formerly of the U. S. Department of Agriculture, in a botanical survey and study of the forest resources of Venezuela.

DR. SIMON FLEXNER, George Eastman visiting professor at the University of Oxford, who retired as director of the laboratories of the Rockefeller Institute for Medical Research with the title emeritus in 1935, gave on February 21 at the department of physiology of the University of Cambridge a public lecture, entitled "Epidemic Poliomyelitis and Epidemic Encephalitis."

DR. CHARLES THOM, of the Bureau of Plant Industry, retiring president of the Washington Academy of Sciences, gave an illustrated address, entitled "A Microbiologist Digs in the Soil," before the academy on February 17.

DR. J. A. RYLE, Regius professor of physic at the University of Cambridge, delivered the Galton lecture at the Galton celebration dinner on February 17 of the Eugenics Society, London. He spoke on "Medicine and Eugenics."

SIR WILLIAM BRAGG, president of the Royal Society, on February 10 gave the first of a series of annual lectures founded by the Manchester Association of Engineers, at the College of Technology. The subject was "Crystallography and the Engineer."

DR. ROBERT FRANKLIN MEHL, director of the Metals Research Laboratory and head of the department of metallurgy at the Carnegie Institute of Technology, will deliver the twelfth annual series of Priestley Lectures at the Pennsylvania State College from March 21 to 25. His subject will be "Reactions in Solid Alloys." The Priestley Lectures were established in 1926 by members of the department of chemistry of the Pennsylvania State College as a memorial to Joseph Priestley, the English-American physical chemist. His house at Northumberland, Pa., has been maintained since 1919 as a museum by the department of chemistry of the Pennsylvania State College. The Priestley Lectures, since 1931, have been a cooperative effort of the School of Chemistry and Physics and the local chapter of Phi Lambda Upsilon, national honorary chemical fraternity. The lectures deal each year with the border-line between physical chemistry and some other branch of science.

Nature gives the following program of lectures on science and industry arranged by the Association of Scientific Workers and given during February and March at University College, London: Sir Richard Gregory, "Science and Industry"; Sir John Russell, "The Application of Science to Food Production"; Major F. A. Freeth, "Science and the Chemical Industry"; Dr. E. A. Rudge, "Training for Industry," and Dr. F. S. Sinnatt, "The Fuel Research Survey."

THE second meeting of the Physics Association of Upper New York State will hold a one-day session at Union College on Saturday, April 2. The program committee, under the chairmanship of Dr. C. W. Hewlett, of the General Electric Company, announces the following invited speakers: R. P. Johnson, Research Laboratory, General Electric Company, "Electron Optics"; Caryl P. Haskins, Union College, "Biological Effects of Cathode Ray Irradiation"; H. P. Gage, Corning Glass Works, "Recent Developments in Glass Manufacture"; Paul E. Hemke, Rensselaer Polytechnic Institute, "Physics in Aeronautical Science"; E. H. B. Bartelink, General Engineering Laboratory, General Electric Company, "Problems in Television." All who are interested in organizing a physics association for upper New York state are invited to attend. An important item of business will be the continuation of the organization steps taken at the meeting at Cornell University last November.

THE first annual Anthracite Conference at Lehigh University will be held on April 29 and 30. Professor Howard Eckfeldt is chairman of the committee on arrangements. Six general subjects dealing with the scientific and technical phases of anthracite will be considered during the conference. These include the inherent characteristics of anthracite, the combustion characteristics of anthracite, combustion and operation of anthracite-burning equipment, some aspects of commercial application, merchandising and civic values and civic values as affected by the use of fuel. Eighteen papers on the various phases of these subjects are scheduled for presentation. Among institutions to be represented on the program are the U. S. Bureau of Mines, Pennsylvania State Geological Survey, Mellon Institute, Anthracite Institute, Anthracite Industries, Inc., and the departments of economics, mechanical engineering and mining engineering of Lehigh University. Honorary chairman of the conference are President C. C. Williams, of Lehigh University; F. W. Earnest, Alan C. Dodson and S. D. Warriner.

Nature reports that an Association for Physical Medicine was inaugurated in London on January 27, with Dr. P. Dalton in the chair. The aims of the society are: (1) To coordinate the various branches of physical medicine under one control; (2) to cooperate with manufacturers in the production of suitable appliances for medical and surgical use, and to prevent their sale to unsuitable persons; (3) to secure a national register of those practicing the science and to affiliate all appropriate bodies; (4) to institute a chair of physical medicine in one or more of the universities and to establish a postgraduate school; (5) to establish contact with the general practitioner and to keep him informed of the changes in the subject; (6) to establish a technical board to act in an advisory capacity.

THE following grants-in-aid were recommended by the National Advisory Cancer Council at its last meeting, February 14: American Registry of Pathology (Army Medical Museum), $3,000; Jackson Memorial Laboratory, Bar Harbor, Maine, for the work of John J. Bittner on the relation of nursing to breast cancer in mice, $3,200; *American Journal of Cancer*, $8,500.

THE chancellor of the University of Cambridge has received from the Rockefeller Foundation a letter stating that action has been taken to provide for the University of Cambridge up to £8,000 towards support of research in its department of experimental medicine for the five-year period dating from January 1, 1938, to December 31, 1942, the amount available in any one year of the grant not to exceed £1,600. It is intended that these funds shall be used for the salaries of a pathologist and a psychiatrist, and for supplementing the amount which the radiologist receives from Addenbrooke's Hospital.

UNDER the terms of the will of the late Virginia Purdy Bacon, of New York, the Smithsonian Institution some years since was bequeathed a fund to establish a traveling scholarship as a memorial to her hus-

band, Walter Rathbone Bacon, for the study of the fauna of countries other than the United States. The amount available is the interest on the capital invested (about $3,000 a year), the incumbent to hold the scholarship not less than two years. Applications for this scholarship, addressed to the secretary of the Smithsonian Institution, should be submitted not later than March 15. The application should contain a detailed plan for the proposed study, including a statement as to the faunal problems involved; the reasons why it should be undertaken; the benefits that are expected to accrue; the length of time considered necessary for the carrying out of the project; the estimated cost, and the scientific and physical qualifications of the applicant to undertake the project.

THE Council of Child Neurology Research announces that applications for grants will be considered at the meetings to be held in April and October of each year. The purpose of the council is to encourage original research on the definite problems coming within the scope of child neurology and allied fields. Applications must be in the hands of the director, Dr. Bernard Sachs, 116 West 59th Street, New York City, before April 1 and September 15. The applicant must state distinctly the problem under investigation and the methods to be pursued.

THE Committee of the House of Representatives on Coinage, Weights and Measures has reported a bill which would fix the length of the inch and weight of the pound. The bill proposes to establish the inch at exactly 25.4 millimeters. This would shorten it by two millionths of an inch. It is now 25.40005 millimeters, as against 25.39996 in Great Britain. Dr. Lyman J. Briggs, director of the Bureau of Standards, spoke before the committee in support of the bill.

DISCUSSION

THAT WORD "EMULSOID"

SHAKESPEARE wrote, "What's in a name?"; but then, he had never heard of "emulsoids." No word has caused more confusion in the colloid-chemical thinking of physiologists than "emulsoid." Biologists continue to take it at its etymological value, while most chemists have long ceased to regard it in this, its original sense. The term was coined by Wolfgang Ostwald in the early years of the present century, when colloid chemistry was still in its infancy, as sciences go. Originally "emulsoids" included coagula, jellies and emulsions, the term being based on the assumption that jellies are fine emulsions. Ostwald's only evidence for assuming that jellies are "emulsion-like" was that both they and emulsions increase in viscosity with increase in concentration of the dispersed phase, while "suspensoids," or solid colloidal suspensions, do not do so. The evidence on which the term was based is correct, but it tells a very small part of the whole story and is entirely misleading. To this day, the concept that jellies are fine emulsions clings, in spite of repeated and substantial proof to the contrary.

My own interest in this matter rests on the mischievous influence of the word "emulsoid" on interpretations of protoplasmic structure. All agree that protoplasm is an "emulsoid," but those biologists who know of the word only from the reading of old and standard texts conclude that protoplasm must be a liquid-liquid system, for that is what the word "emulsoid" means, *i.e.*, "emulsion-like," and emulsions are liquid-liquid systems. Other workers, knowing the historical background of colloid chemistry, realize that the word "emulsoid" has long since lost its original meaning, for no chemist well grounded in his knowledge of the colloidal state believes jellies to be like emulsions, except in that one property which Ostwald selected for the basis of his classification. In every other respect, dispersions of gel-forming substances are quite distinct from emulsions. Whatever their structure, jellies are not liquid-liquid systems.

Though there are some interesting experiments which indicate that protoplasm behaves like an emulsion, many physiologists regard the similarity as purely incidental and superficial. The emulsion hypothesis of protoplasmic structure satisfies but few conditions, and is wholly contrary to many of the most significant properties of living matter. Among speculations on the emulsion nature of protoplasm, there is one that has recently come to my attention, namely, that the human brain is an emulsion; not only this, but it is said to reverse from oil-in-water to water-in-oil. While I know little about the histology of the brain, I am convinced that the hypothesis is based on the keen sense of humor of its author, for a brain that is an emulsion of water dispersed in a continuous phase of oil is a brain through which little can penetrate. Perhaps the author of the theory has some colleague in mind!—The brain consists of cells, or so-called cell-bodies, with their fibrous axons and dendrites, interwoven by a supporting framework of neuroglia, the whole bathed in fluid: this is not an emulsion.

It is not, however, my purpose here to discuss the "emulsoid" hypothesis of protoplasmic structure, but rather to plead with physiologists to give up ideas on

gel structure which most chemists have long since discarded.

The controversy is an old one, but I had rather assumed that it was amicably settled, yet on reviewing of late a number of text-books on physiology and chemistry, the persistence of the theory was brought to my attention in a striking way. A note, therefore, seems worthwhile.

None of us treads with security when wandering far from our chosen field of research, as every physiologist must if he covers his subject in a broad way, but an author may save himself and his readers from old and discarded ideas by simply turning to an authoritative source. In the present instance, the colloid chemist is the man to whom physiologists must turn. An outstanding authority such as Freundlich[1] says that the word "emulsoid" must either be dropped or its original and etymological meaning ignored.

Selections from five new books, four in physiology and one in chemistry, illustrate how poorly biologists and some others have heeded this advice of Freundlich.

In one text, emulsoids are defined as liquid-liquid systems, and milk cited as an example. On the next page, the author states that in addition to "these various types of colloidal suspensions, mention should be made of emulsions," which he again defines as liquid-liquid systems with milk as an example. What is the student to make out of this, for not only is an emulsoid given the twenty-five-year-old and discarded definition of Ostwald, but the author tells the student that *another* type of system will now be considered, namely, emulsions, and then gives the same definition and the same example already stated for emulsoids.

In the second text, "colloidal theories" are introduced by a reference to "emulsoids," then, without any break in thought, the emulsion hypothesis of cell permeability is presented.

Two other text-books publish the diagrams first used by Bayliss and intended to illustrate a hydrosol and a hydrogel. The first figure is of black spots on a white background and labelled "hydrosol"; the second is of white spots on a black background and labelled "hydrogel." These are typical diagrams of an oil-in-water and a water-in-oil emulsion.

Bayliss refers to the scattered black spots of the "hydrosol" and the black background of the "hydrogel" as solid matter and thus regards the hydrogel of gelatine as similar to that of silica. This is in keeping with the micellar theory of gel structure which Bachmann thought he had shown to be true for gelatine. The error of Bayliss lay not so much in supporting the micellar hypothesis of gel structure but in assuming that water is firmly held in a jelly because it is "imprisoned" between "solid walls."

[1] "Capillary Chemistry," 1926.

Water is firmly retained in jellies not because it is trapped in pockets or in isolated drops, but because it is bound by adsorptive or other forces.

Those who have copied the black and white diagram of Bayliss misinterpret the situation still more by referring to jellies as fine emulsions and to the setting of gelatine as involving phase-reversal. The figure is labelled "a diagram to illustrate the reversal of phases during sol-gel transformation." With this statement the assumption is again made that "enormous pressure is required to squeeze water out of a set hydrogel," because "the previously continuous phase—becomes the dispersed phase."

The author of a recent book on the colloidal state of matter asserts that liquid-in-liquid systems *include* the "emulsoids," and these in turn "contain the emulsions." The author realizes that emulsions are not good "emulsoids" and suggests that they be put in a separate group, but he gives as reasons that many emulsions are outside of the colloidal range because of the size of the dispersed drops, and many are not simple two-phase systems; all of which is true, but these are not the reasons why emulsions are not "emulsoids," as the term is now generally used.

The structure of jellies is not known with certainty, though much progress on this subject has been made in the past quarter of a century. At the first Colloid Symposium (in 1923) a preliminary (and as yet unpublished) report on the structure of gelatine was given. The speaker referred to the gelatine molecule as a fiber of great but definite length, with a cross-section of not more than a few Ångstrom units. It is only necessary to postulate an interweaving or other specific grouping of these molecular fibers to obtain the type of structure now very generally applied to jellies and to protoplasm.

Whether the fibrillar (chain molecule) or micellar theory of gel structure is the correct one is unimportant so far as the point under discussion is concerned. Here we are concerned only with the generally held point of view that jellies are not fine emulsions and gelatinization does not consist in a reversal of phases.

Ellis[2] and Donnan stated in 1913 that neutral oil emulsions are model *suspension* colloids; that is to say, they are "suspensoids," and not "emulsoids." Four years later, Hatschek,[3] on the basis of a neat mathematical-physical analysis, asserted that "the theory that gels consist of two liquid phases must be pronounced untenable." McBain[4] has since found that there is no change in the electrical conductivity of a soap sol when it sets to a gel, which means that the continuous and conducting phase remains the same;

[2] Transactions of the Faraday Society, 9: 14, 1913.
[3] Transactions of the Faraday Society, 12: 17, 1917.
[4] *Jour. Phys. Chem.*, 28: 706, 1924.

there is, therefore, no reversal of phases. The work of the x-ray investigators, Sponsler,[5] Astbury,[6] *et al.*, should be sufficient to convince one that gels and jellies are not emulsions.

Much confusion and erroneous instruction will be avoided if the word "emulsoid" is discarded. It was based on a misconception and is no longer used by well-informed chemists in its original sense.

So with Lady Macbeth, I cry, "Out, damned *emulsoidal* spot! out, I say!"

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THE EFFECT OF SPECTRAL REGIONS ON THE CHLOROPHYLL "A" TO "B" RATIO

IN an investigation of the photochemical responses of the wheat plant to spectral regions, Lease and Tottingham[1] found the chlorophyll content to be affected. This effect was in the direction of increased chlorophyll content and greener tissues when the blue-violet was added to the red-yellow region of the spectrum. The implications of these results and the related investigations of Guthrie[2] concerning the chlorophyll "a" to "b" ratio have been followed and somewhat confirmed. Substituting for their colorimetric methods, a spectrophotometric method, a small but consistent lowering of the proportion of chlorophyll "a" to "b" has been found in wheat plants grown under a filter which absorbs the blue end of the spectrum. In agreement with work of other investigators, the absorption curves of the pure components, isolated by the procedure of Zscheile,[3] show that the ratio of the absorption coefficients of chlorophyll "a" to "b" is higher in the red than in the blue region of the spectrum. It is to be expected that the higher activation of chlorophyll "a" in red light would lead to a lowering of the "a" to "b" ratio. Apparently the almost universal proportion of three to one in normal green plants may be dependent upon the relatively constant quality of sunlight.

The lowering of the "a" to "b" ratio is increased (if it is assumed that the absorption spectrum of a chlorophyll is a sufficient criterion of its presence and amount) by irradiating with monochromatic light of such wave-length as will be largely absorbed by chlorophyll "a". Subsequent comparison of the absorption curve of an acetone extract of the irradiated leaves with that of an unirradiated sample shows an increase in maxima corresponding to chlorophyll "b" and an attendant decrease in chlorophyll "a" maxima, in both the red and blue regions. The presence of carotenoids in this extract was found to offer no significant interference. In so far as the absorption curve may be considered indicative, there is no change in total chlorophyll. An attempt is now being made to determine if the process may be reversed and chlorophyll "b," or substances absorbing in that region, be reduced to chlorophyll "a" through selective activation with monochromatic light.

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[5] *Jour. Gen. Physiol.*, 9: 221, 1925.
[6] "Fundamentals of Fibre Structure," Oxford, 1933.
[1] E. J. Lease and W. E. Tottingham, *Jour. Am. Chem. Soc.*, 57: 2613, 1935.
[2] John D. Guthrie, *Am. Jour. Bot.*, 16: 716, 1929.
[3] Paul F. Zscheile, *Bot. Gaz.*, 95: 529, 1934.

THE "DANA" AND THE "RESEARCH"

IN an article under the heading "The Danish Nonmagnetic Research Ship," in SCIENCE (January 21, 1938, pp. 59–60) there was some confusion regarding the Danish vessel *Dana* and the *Research* of the British Admiralty. It is felt this matter should be set right in order that mistaken impressions may not persist.

The Danish Meteorological Institute advises that the *Dana* is an iron vessel, recently constructed in Denmark for oceanographical and fishery researches; it is unsuitable for magnetic observations at sea.

The *Research*, on the other hand—now under construction—is a non-magnetic vessel especially designed for magnetic observations at sea to continue the oceanic work of the *Carnegie* which was so unfortunately lost in 1929 at Apia, Western Samoa. The need of such a vessel is clear from a consideration of the lacunae in the magnetic data required for the construction of magnetic charts. These gaps would have been filled had the *Carnegie* completed her last cruise, but, taken in connection with the recent rapid changes in secular variation and shifts of isoporic foci—notably in the Indian Ocean—they make for considerable uncertainty and possibly serious errors in extrapolated values of the magnetic elements over large areas.

The Carnegie Institution of Washington cooperated with the British Admiralty in the design and equipment of the *Research* by supplying plans, specifications and descriptions of the *Carnegie* and of her equipment. W. J. Peters, the first commander of the *Carnegie* and designer of many of the special instruments required for increased precision of observations at sea, spent a year in England as a consultant to the Admiralty on the construction and instrumental outfit of the *Research*.

J. A. FLEMING

THE IDENTIFICATION OF VITAMIN C

PRIORITY questions are not of primary importance to science and should be left to posteriority. If, however, such problems are discussed it is desirable that statements made should be correct and complete.

The chronological list of events given by G. C. Cox[1]

[1] SCIENCE, December 10, 1937, p. 540.

should be completed with reference to my lecture delivered before the Hungarian Medical Association on March 18, 1932. In this lecture the identity of Vitamin C and the "hexuronic acid," described by myself in 1928, was definitely stated and experimental evidence given. This lecture was reported by all journals publishing the proceedings of that society.[2] The text of this lecture was published unchanged in the *Deutsche Med. Wochenschrift* (No. 22, 1932). This paper was followed by the note of King and Waugh in SCIENCE of April 1, and the two notes of Svirbely and Szent-Györgyi in *Nature* of April 16 and May 7.

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REPORTS

FULL TEXT OF THE NEW ORGANIC NOMENCLATURE RULES

IN 1930 the International Committee on the Reform of the Nomenclature of Organic Chemistry adopted a Definitive Report, which was published in various journals.[1] In that report Rules 34 and 49 merely stated that the topics to which they referred would be considered later. A translation of the new official French text of these rules as adopted tentatively by the committee at Lucerne in 1936 is here given. Any one having criticisms should communicate with me as early as possible in order that these may be considered by the American committee before the meeting of the International Union of Chemistry in Rome next May. Other organic nomenclature matters that may come up at the Rome meeting are: cyclic compounds with side chains containing functional groups; deuterium compounds; radical names; numbering of ring systems. Proposals regarding any of these topics should also be made soon.

RULE 34

a. Derivatives of hydrogen arsenide, AsH_3, will be named like the amines and their derivatives, with the ending *arsine*. The univalent radical $-AsH_2$ will be designated by the prefix *arsino*.

Examples: CH_3AsH_2, methylarsine; $(CH_3)_3As$, trimethylarsine; $(CH_3)_2AsCl$, chlorodimethylarsine; $(CH_3)_3AsO$, trimethylarsine oxide; $H_2AsCH_2CH_2AsH_2$, 1, 2-diarsinoethane or ethane-1, 2-diarsine; $(C_2H_5)_4AsOH$, tetraethylarsonium hydroxide; $(CH_3)_2AsAs(CH_3)_2$, tetramethylbiarsine.

b. Acids of the types $RHAs(:O)OH$ and $RR'As(:O)OH$ will be named *arsinic* acids; those of the type $RAs(:O)(OH)_2$ will be named *arsonic acids*. The radical $>AsO_2H$ will be designated by the prefix *arsinico*, the radical $-AsO_3H_2$ by the prefix *arsono*.

Examples: $(CH_3)_2AsO_2H$, dimethylarsinic acid; $C_6H_5AsO_3H_2$, benzenearsonic acid.

c. Rules *a* and *b* are applicable to the analogous compounds of phosphorus and antimony, the syllable "ars" being replaced respectively by *phosph* or *stib*.

d. The following list includes the prefixes and suffixes applicable to the most common compounds of phosphorus, arsenic and antimony:

Radical	*Prefix*	*Suffix*
$-AsH_2$	arsino	arsine
$-AsO$	arsenoso	
$-AsO_2$	arso	
$>As(:O)OH$	arsinico	arsinic
$-As(:O)(OH)_2$	arsono	arsonic
$-As=As-$	arseno	
$-PH_2$	phosphino	phosphine
$-PO$	phosphoroso	
$-PO_2$	phospho	
$>P(:O)OH$	phosphinico	phosphinic
$-P(:O)(OH)_2$	phosphono	phosphonic
$-P=P-$	phosphoro	
$-P=N-$	phosphazo	
$-P=As-$	phospharseno	
$-SbH_2$	stibino	stibine
$-SbO$	stiboso	
$-SbO_2$	stibo	
$>Sb(:O)OH$	stibinico	stibinic
$-Sb(:O)(OH)_2$	stibono	stibonic
$-Sb=Sb-$	antimono	
$-Sb=As-$	stibarseno	

e. Derivatives of bismuthine, BiH_3, will be named like the arsines.

f. Compounds of arsenic, phosphorus, antimony and bismuth which can not be named clearly by the preceding rules will be named as derivatives of arsines, phosphines, stibines or bismuthines or (if possible) as organometallic derivatives (rule 48).

Examples: CH_3BiO, methylbismuth oxide; CH_3SbCl_4, methylantimony tetrachloride; $(C_6H_5)_2AsOC_2H_5$, ethoxydiphenylarsine; $(CH_3)_2AsOH$, hydroxydimethylarsine or dimethylarsenic hydroxide; CH_3SbS, methylantimony sulfide; $[(CH_3)_2As]_2O$, bis(dimethylarsenic) oxide or cacodyl oxide.

RULE 49*a*

I. Cyclic hydrocarbons with aliphatic side chains are to be named according to one of the two following methods: (α) The radical names denoting the side chains are prefixed to the name of the cyclic hydrocarbon. (β) The cyclic hydrocarbon residue, if it can be named as a radical, is considered a substituent of the aliphatic chain.

Naming according to (α) is in general preferable when the side chain is short or when several side chains are present. Naming according to (β) is more convenient when the side chain is long, and particularly when the cyclic hydrocarbon residue is not at the end of this chain.

Examples: (α) $C_6H_5C_2H_5$, ethylbenzene; $CH_3C_6H_4C_2H_5$, methylethylbenzene; $C_{10}H_7CH:CH_2$, ethenylnaphthalene.

(β) $CH_3CH(C_6H_5)(CH_2)_5CH_3$, 2-phenyloctane;

[2] *Vide, e.g., Orvosi Hetilap*, 76: 259, 12, from March 26, or *Monatshefte Ungarisher Mediziner*, etc.

[1] See, for example, *Jour. Am. Chem. Soc.*, 55: 3905–25, 1933.

p-$(CH_3)_2CHC_6H_4CH(CH_3)CH(CH_3)(CH_2)_3CH_3$, 3-methyl-2-(4-isopropylphenyl)heptane.

For naming cyclic hydrocarbons with side chains according to (α), it is advisable in many cases to use the common names of simple aromatic hydrocarbons.

Examples: o-$CH_3C_6H_4C_2H_5$, 2-ethyltoluene; $(CH_3)_2C_6H_4CH:CH_2$(1,3,2), 2-ethenyl-m-xylene; $CH_3C_6H_3(C_2H_5)CH(CH_3)_2$(1,2,4), 2-ethyl-$p$-cymene.

II. When several cyclic hydrocarbon residues are united by an aliphatic chain the name of the compound will be derived from that of the aliphatic hydrocarbon, provided radical names are available for the cyclic hydrocarbon residues.

Examples: $C_6H_5CH_2C_6H_5$, diphenylmethane; $C_6H_5CH_2CH(C_6H_5)(CH_2)_2CH_3$, 1,2-diphenylpentane.

If this is not the case, or if the possibility of using a convenient radical name makes it desirable, the name of the compound will be derived from that of one of the cyclic hydrocarbons, on the principle of substitution.

Examples: $C_{14}H_9CH_2C_6H_5$(2), 2-benzylanthracene (better than phenyl-(2-anthryl)methane); $C_{16}H_9CH_2CH_2C_6H_5$, (β-phenylethyl)pyrene.

RULE 49*b*

When the cyclic hydrocarbons treated of in rule 49*a* carry functions which can be expressed only by a prefix, the same possibilities for names exist as those indicated in rule 49*a*.

Examples: $C_6H_5CHClCH_2Cl$, 1,2-dichloro-1-phenylethane or (α, β-dichloroethyl)benzene; $C_6H_5CH_2CH(CH_3)CH_2Cl$, 3-chloro-2-methyl-1-phenylpropane or (γ-chloroisobutyl)benzene; p-$ClC_6H_4CH_2CH_2Cl$, 4-chloro-1-(β-chloroethyl)benzene or 2-chloro-1-(4-chlorophenyl)ethane.

For naming derivatives of monocyclic hydrocarbons which have common names, it will be of advantage to employ these names.

Examples: p-$ClC_6H_4CH_3$, 4-chlorotoluene (4-chloro-1-methylbenzene); p-$ClC_6H_4CH_2Cl$, 4,ω-dichlorotoluene (4-chloro-1-(chloromethyl)benzene, 4-chlorobenzyl chloride); $CH_3C_6H_4(NO_2)CH(CH_3)_2$(1,2,4), 2-nitro-$p$-cymene (2-nitro-1-methyl-4-isopropylbenzene).

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SPECIAL ARTICLES

TOBACCO SMOKING AND LONGEVITY[1]

IN the customary way of life man has long been habituated to the routine usage of various substances and materials that are not physiologically necessary to his continued existence. Tea, coffee, alcohol, tobacco, opium and the betel nut are statistically among the more conspicuous examples of such materials. If all six are included together as a group it is probably safe to say that well over 90 per cent. of all adult human beings habitually make use of one or more of the component materials included in the group. All of them contain substances of considerable pharmacologic potency if exhibited in appropriate dosage. Widespread and long-continued experience, however, has shown that the moderate usage of any of these materials, if measurably deleterious at all, is not so immediately or strikingly harmful physiologically as to weigh seriously against the pleasures felt to be derived from indulgence, in the opinion of vast numbers of human beings. The situation so created is an extremely complex one behavioristically, and not a simple physiological matter, as it is sometimes a little naively thought to be. Purely hedonistic elements in behavior, which are present in lower animals as well as in man, have a real importance. Indeed they frequently override, in their motivational aspects, reason as well as purely reflex physiological inhibiting factors. There are undoubtedly great numbers of human beings who would continue the habitual use of a particular material they liked, even though it were absolutely and beyond any question or argument proved to be somewhat deleterious to them. Most of them would rationalize this behavior by the balancing type of argument—that the keen pleasure outweighed the relatively (in their view) smaller harm.

The student of longevity is not primarily interested in the behavioristic aspects of the situation under discussion. His concern is to appraise quantitatively, with the greatest attainable accuracy, the effect of each of these habitual usages upon the duration of life. This problem is necessarily statistical in its nature, for in the ordinary way of usage the effect upon longevity of any of the materials mentioned is not sufficiently strong or immediate to be disentangled in the individual from the effects of other and more powerful factors that are involved, such as infections, for example. An approximate evaluation of the statistical effect of these minor and secondary factors influencing longevity can, however, be reached by the application of actuarial methods (life table construction) to groups of individuals. For the maximum effectiveness of this methodology in the premises, the groups to be compared should be each as heterogeneous or random as possible in their compositions relative to all other characteristics *except* the one of degree of habitual usage of the particular material under discussion, and as homogeneous

[1] From the Department of Biology, School of Hygiene and Public Health, Johns Hopkins University, Baltimore, Maryland. This paper constitutes No. VII in the writer's series of "Studies on Human Longevity." The writer is indebted to Dr. John R. Miner for computational aid.

as possible relative to that. We shall then have a dispersed and counterbalancing effect within each group of all such factors as economic and social status, occupational and racial differences, etc., the plus variants relative to each such factor offsetting more or less evenly the minus variants; while there will be a concentrated, unidirectional and statistically cumulative effect, if any, of the habitual usage factor under test, since all components of a group will be alike in respect of it.

The purpose of this paper is to report a part of the results of an investigation of the influence of tobacco upon human longevity, planned and carried out along the lines indicated above. The material was drawn from the Family History Records[2] of this laboratory. It is composed of data collected at first hand and *ad hoc*. The accuracy of the data as to the relative degree of habitual usage of tobacco and as to the ages of the living at risk, and of the dead at death can be guaranteed. The figures presented here deal only with white males, and concern only the usage of tobacco by smoking. The material falls into three categories, as follows: *non-users* of tobacco, of whom there were 2,094; *moderate smokers,* of whom there were 2,814; and *heavy smokers,* of whom there were 1,905. In other words, the results presented here are based upon the observation of 6,813 men in total. These men were an unselected lot except as to their tobacco habits. That is to say, they were taken at random, and then all sorted into categories relative to tobacco usage.

Complete life tables have been constructed for the three groups defined above relative to tobacco usage by smoking. The tables start at age 30 and continue to the end of the life span, by yearly intervals. Here only a condensation of the tables can be presented. This is done in Table 1, where the death rate (1000 q_x) and survivorship (l_x) function are given by five-year intervals.

TABLE 1

THE DEATH RATE (1,000 q_x) AND SURVIVORSHIP (l_x) FUNCTIONS, AT FIVE-YEAR INTERVALS, STARTING AT AGE 30, OF (a) NON-USERS OF TOBACCO; (b) MODERATE SMOKERS WHO DID NOT CHEW TOBACCO OR TAKE SNUFF; (c) HEAVY SMOKERS WHO DID NOT CHEW TOBACCO OR TAKE SNUFF. WHITE MALES

Age	Non-users		Moderate smokers		Heavy smokers	
	1,000 q_x	l_x	1,000 q_x	l_x	1,000 q_x	l_x
30	8.18	100,000	7.86	100,000	16.89	100,000
35	8.78	95,883	9.63	95,804	21.27	90,943
40	10.01	91,546	11.89	90,883	23.91	81,191
45	12.04	86,730	14.80	85,129	25.69	71,665
50	15.16	81,160	18.61	78,436	27.49	62,699
55	19.82	74,538	23.67	70,712	30.09	54,277
60	26.73	66,564	30.49	61,911	34.29	46,226
65	36.88	57,018	39.83	52,082	41.20	38,328
70	51.69	45,919	52.84	41,431	52.72	30,393
75	73.02	33,767	71.28	30,455	72.33	22,338
80	103.22	21,737	97.95	19,945	100.44	14,494
85	142.78	11,597	136.50	10,987	139.48	7,865
90	197.49	4,753	190.23	4,686	193.68	3,292
95	273.2	1,320	265.1	1,366	268.9	938

[2] For an account of the nature of these Family History Records see R. Pearl, *Biotypologie,* T. 2, pp. 105–122, 1934, and other references there cited.

Those not particularly accustomed to life table figures will perhaps get quickly a better grasp of the general import of the results from Fig. 1 than from the table. Fig. 1 shows the survivorship lines plotted from the individual year figures.

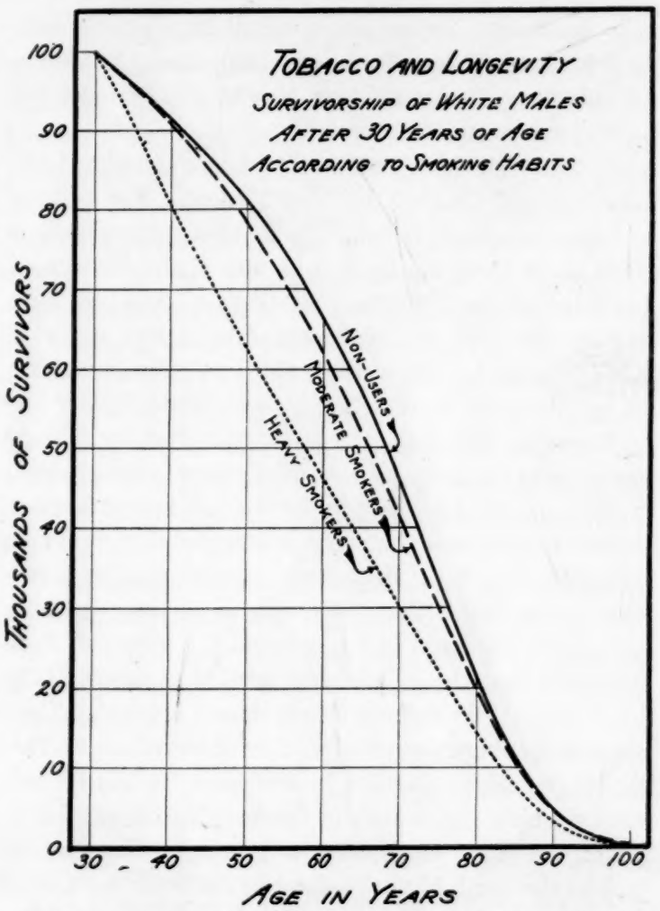

FIG. 1. The survivorship lines of life tables for white males falling into three categories relative to the usage of tobacco. A. Non-users (solid line); B. Moderate smokers (dash line); C. Heavy smokers (dot line).

However envisaged, the net conclusion is clear. In this sizable material the smoking of tobacco was statistically associated with an impairment of life duration, and the amount or degree of this impairment increased as the habitual amount of smoking increased. Here, just as is usually the case in our experience in studies of this sort, the differences between the usage groups in specific mortality rates, as indicated by q_x, practically disappear from about age 70 on. This is presumably an expression of the residual effect of the heavily selective character of the mortality in the earlier years in the groups damaged by the agent (in this case tobacco). On this view those individuals in the damaged groups who survive to 70 or thereabouts are such tough and resistant specimens that thereafter tobacco does them no further measurable harm as a group.

RAYMOND PEARL

MENTAL EFFICIENCY, CARBOHYDRATE METABOLISM AND NUTRITIONAL HYDRATION

Various investigators[1] have called attention to the value of insulin in the treatment of some cases of schizophrenia, but a satisfactory explanation of the results does not seem to have been arrived at. The possibility does not appear to have been considered that the mental improvement noted in schizophrenics may primarily be a physiologic improvement in mental efficiency, such as Glaze observed in presumably normal subjects after fasting.[2]

As one of the subjects for Dr. Glaze's study at the University of Chicago, I fasted 33 days. For a study of hunger during this fast,[3] blood-sugar determinations were made upon me by Dr. Larson at the College of Medicine of the University of Illinois. On the ninth day of the fast, the blood-sugar level was down to 0.043 per cent. After that, the level was somewhat higher, but the final determination made during the fast was so low that it was thought best to discard the result in the absence of further confirmation. Unfortunately, I already broke the fast before another determination could be made, but increasing weakness and difficulty with air-hunger suggest that a blood-sugar level lower than 0.043 per cent. may actually have been reached. In any case, the accepted data indicated that the blood-sugar level was substantially below normal throughout this fast, and Lennox, O'Connor and Bellinger reported similar observations.[4] This makes it evident that the improvement in mental efficiency which was noted by Glaze followed periods in which the blood-sugar level was kept low by fasting, just as the mental improvement in some schizophrenics seems to be a consequence of hypoglycemic states induced by insulin.

A less obvious parallelism is indicated by the fact that the insulin treatment of schizophrenics does not bring about improvement in some apparently uncomplicated cases and fasting likewise does not always lead to mental and/or physical improvement in so-called normal subjects. In fact, the results of fasting at different times may vary widely in the same individual. This conclusion is based mainly upon a personal evaluation of the results of various fasts undertaken by me during the past thirty years. Thus, I have sometimes noted a striking improvement in general well-being, including a brief period of elation with increased self-confidence and sociability, after a fast of only one day or a few days, while the result of my longest fast (41 days) proved to be one of the greatest disappointments. In my estimation, the differences in the results were chiefly due to variations in the degree of hydration experienced after fasting. Post-fasting edema may indeed be severe enough to completely obscure any possible benefit from fasting. An inadequate protein intake and an excessive carbohydrate intake after fasting increase hydration,[5] and this raises the question whether the administration or ingestion of excessive amounts of carbohydrate following the use of insulin in the treatment of schizophrenics may not also, in some cases, counterbalance any possible benefit.

It is still a question whether the favorable results of the insulin treatment of schizophrenics will be more or less permanent and, similarly, some may wonder whether the possible benefits of fasting are worth the price. Obviously, the benefits of fasting have not been cumulative in my own case. Anything that may be gained by fasting can be lost again by an unsuitable food intake after fasting. My opinion of the value of fasting is perhaps best reflected by the fact that, after having previously fasted altogether over 500 days, I have not fasted a single day during the past five years. The chief reason for this, however, is that I have been increasingly impressed with the importance of nutritional and post-fasting edema. Besides this, I never liked fasting and would welcome a practical substitute, such as the insulin treatment may be in some cases of schizophrenia and the ketogenic diet seems to be in some cases of epilepsy. My impression, nevertheless, is that no simple and entirely satisfactory substitute for fasting will be found, although repeated short or modified fasts may prove to be adequate and practical substitutes for prolonged fasts.

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THE GERMINATION OF LETTUCE SEED STIMULATED BY CHEMICAL TREATMENT

PREVIOUS investigations have been reported showing that the germination of dormant lettuce seed is influenced by temperature, light, oxygen and the CO_2 content of the surrounding atmosphere. In investigating various methods of treating such seed to promote prompt germination it was found that the percentage of germination of certain lots of lettuce seed could be greatly increased by treating the seed with weak solutions of certain chemicals. Many lots of lettuce seed of the varieties Grand Rapids and Hubbard Market have been found to germinate poorly on damp filter paper in Petri dishes in darkness at 25° C., whereas other lots germinated very well when the paper in the

[1] Among others: H. E. Himwich, K. M. Bowman, J. Wortis and J. F. Fazekas, SCIENCE, 86: 271, 1937; J. Steinfeld, *Jour. Amer. Med. Assn.*, 108: 91, 1937; H. M. Smith, *ibid.*, 108: 1959, 1937; D. E. Cameron and R. G. Hoskins, *ibid.*, 109: 1246, 1937; and C. A. Rymer, J. D. Benjamin and F. G. Ebaugh, *ibid.*, 109: 1249, 1937.

[2] J. A. Glaze, *Am. Jour. Psychol.*, 40: 236, 1928.

[3] F. Hoelzel and N. Kleitman, *Arch. Internal Med.*, 39: 710, 1927.

[4] W. G. Lennox, M. O'Connor and M. Bellinger, *Arch. Internal Med.*, 38: 553, 1926.

[5] F. Hoelzel, SCIENCE, 86: 399, 1937.

dishes was moistened with 0.5 per cent. solutions of thiourea, allyl thiourea, ammonium thiocyanate and potassium thiocyanate. Germination was greatly increased above that obtained from lots of the same seed germinated on filter paper moistened with distilled water. The comparative tests were all made in darkness at 25° C.

On one lot of dormant lettuce seed the 0.5 per cent. solutions of these four compounds gave the following percentages of germination: Thiourea, 94.25 per cent.; allyl thiourea, 83.25 per cent.; ammonium thiocyanate, 69.75 per cent.; and potassium thiocyanate, 36.25 per cent. as compared with 22.75 per cent. for the check lots germinated on filter paper moistened with water. Differences of 5.8 per cent. or greater are significant.

Seeds were treated with 0.1, 0.2, 0.5 and 1.0 per cent. concentrations of each compound. The optimum concentrations for the four most effective compounds were found to be near 0.5 per cent. In each case the highest germination was obtained with the 0.5 per cent. solution.

Other chemicals, including urea, sodium nitrate, ammonium sulfate, potassium ferricyanide, potassium ferrocyanide and calcium sulfate, were also used in the above four concentrations. While some of these in certain concentrations gave some increase in germination over the untreated check, the differences were not statistically significant. None of these approached the effectiveness of the 0.5 per cent. solutions of thiourea, allyl thiourea, ammonium thiocyanate and potassium thiocyanate, and in many cases the chemical definitely retarded germination.

Although thiourea gave the greatest increase in germination, the development of the embryo was abnormal in that the hypocotyl elongated much more rapidly than the radical. In many cases there was little or no radical development. Ammonium thiocyanate and allyl thiourea both resulted in normal embryo development.

That the failure of dormant lettuce seed to germinate is not in all cases due to the same conditions is indicated by the fact that all lots of such seed do not respond to the same treatment. Some lots respond to low temperature, while others do not. Some require exposure to light in addition to low temperature. In some cases a varying temperature is more effective than a constant temperature. Different lots of dormant seed were found to vary greatly in their response to chemical treatments. Thiourea was the only chemical that was effective on all lots of dormant seed tested. Some lots of seed gave no response to various concentrations of allyl thiourea, ammonium thiocyanate and potassium thiocyanate. One lot of seed that gave a check germination of 69 per cent. germinated 97 per cent. when treated with the 0.5 per cent. concentration of thiourea. The other three chemicals failed to give a significant increase in germination above the check at any of the four concentrations.

The most effective concentration of urea (0.2 per cent.) gave only 15 per cent. germination as compared with 94 per cent. for the 0.5 per cent. concentration of thiourea. The most effective concentration of potassium cyanide (0.2 per cent.) gave only 33 per cent. germination, as compared with 50 per cent. germination for the 0.5 per cent. solution of potassium thiocyanate. In these comparisons differences of 14.11 per cent. are significant. In both comparisons the occurrence of the element sulfur in the compound resulted in a marked increase in germination. The increase in germination can not be attributed to sulfur alone, since various concentrations of other sulfur-containing compounds, including ammonium sulfate, sulfuric acid, sulfanilic acid, and calcium sulfate, failed to increase and, in most cases, retarded germination. The point of interest here is the striking difference between thiourea and urea which differ only in the presence of sulfur in thiourea. Thiourea always gave some increase in germination, while urea in every case retarded it.

The writers offer no explanation for the role these chemical compounds may play in stimulating germination in certain lots of lettuce seed that show marked dormancy when germination tests are carried out in darkness at 25° C.

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EXCEPTIONAL TEMPERATURES OF CENTRAL ATLANTIC WATER[1]

CHURCH[2] summarizes the analysis of numerous thermograph records of the surface waters of the western North Atlantic. Used in the analysis were the records obtained by the Biological Board of Canada through the courtesy of the Canadian National Steamships. A recent record, August 28 to August 30, 1937, on a route between Boston and Bermuda indicates exceptional water temperatures of Central Atlantic water north of Bermuda. The instruments were checked at the end of the voyage.

On this route, Central Atlantic water lies south and southeast of the Gulf Stream, and is characterized by the comparative homogeneous nature of the surface temperatures. Minimum temperatures are attained in late winter, and maximum temperatures are reached in late August. According to Church and Iselin,[3] the

[1] Published with the permission of the Biological Board of Canada.

[2] P. E. Church, Assoc. d'Oceanographie physique, Publ. Scien. 4, 1937.

summer maximum of Central Atlantic water is 27° C. or 28° C. north of Bermuda, and the annual range is fully eight degrees.

The water temperature record of the Boston-Bermuda route between August 28 and August 30, 1937, is illustrated in Fig. 1. Imposed upon this is the water

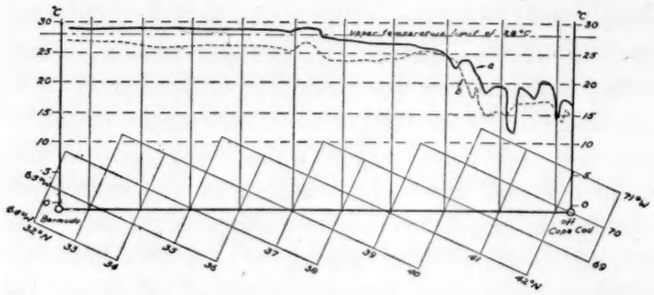

FIG. 1. Distribution of surface water temperature between Boston and Bermuda—(a) August 28 to August 30, 1937, and (b) September 24 to September 26, 1937.

temperature record on the same route between September 24 and September 26, which indicates that the northern edge of the Gulf Stream is in Latitude 40° 10′ N. In August, it is evident that "detached warm masses" extended even north of Latitude 41° 00′ N.

Central Atlantic water, south of Latitude 37° 50′ N., in the latter part of August exhibits surface temperatures which are more than one degree higher than the upper temperature limit of 27° C. or 28° C., set by Church and Iselin. Gulf Stream temperatures (vicinity of Latitude 40° 00′ N.) are at least two degrees lower than the accepted summer maximum of 28° C. or 29° C. Further, in the interval between late August and late September, the surface water temperatures south of Latitude 39° 00′ N. were lowered as much as three degrees, which is more than one third of the total annual temperature range of Central Atlantic water of these latitudes. This large decrease in temperature took place at a time when ocean surface temperatures are, in general, comparatively stationary. It is suggested herein that such a temperature change is, in part, associated with a "pulsation"[4] of the whole North Atlantic eddy. The nature of the suggested "pulsation," of considerable interest to oceanographers on both sides of the Atlantic, awaits elucidation from the five year cooperative program of the Woods Hole Oceanographic Institution and the Bermuda Biological Station.

Our observations have been concerned with a band of water, which, north of Bermuda, is approximately 500 miles in width. In dealing with water temperature departures from the normal, Church points out the possible influence of these in producing weather abnormalities along the eastern seaboard of the North American continent. This band of water is associated with the source area for tropical Atlantic air masses, and in particular with the area of origin of North Atlantic tropical cyclones, which are features of late summer weather of the Atlantic seaboard. The abnormalities of temperature of Central Atlantic water, recorded herein, may therefore prove of interest also to students of marine meteorology.

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[3] C. O'D. Iselin, Papers in Physical Oceanography and Meteorology, 4: 4, 37, 1936.

[4] E. W. MacBride, *Nature*, 139: 3527, 948, 1937.

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